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ENTOMOLOGICAL NEWS

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A Pictorial Review of the North American Chipmunk Fleas

By C. ANDRESEN HUBBARD, Vanport College, Portland 3, Oregon

Foreword: Chipmunks have long been favored pets among small boys and girls in this country. Usually they are trapped by the youngsters in the fields and forests about and kept either in cages or on a string to crawl about the person and hide in the pockets. At times pet shops feature chipmunks for children's pets. In certain localities over the country both the chipmunks and certain of their fleas have been found plague positive. The chipmunks and their fleas should, therefore, be watched carefully by health agencies. It is because of the plague possibilities involved that this paper becomes of importance.

Part One—MONOPSYLLUS EUMOLPI (Roths.); with four new subspecies.

Close to the turn of this century Brooks and Wenmann were collecting fleas in British Columbia and Alberta, Canada for Charles Rothschild, who was working them in England as a hobby and probably for relaxation from the business worries of the great banking concern bearing his name. Among other fleas to arrive in England was a series off Canadian chipmunks. Rothschild studied these until 1905, during which year he described them as *Ceratophyllus eumolpi* but which are known today as

Monopsyllus eumolpi (Rothschild).
1905 *Ceratophyllus eumolpi* Rothschild, Nov. Zool., 12: 161.

This, the parent species, of what in this paper involves 6 subspecies, has the following pattern and characteristics in the modified segments. Male: Finger roughly rectangular to ham-shaped, with characteristic armature consisting of 3 spiniforms on the posterior border, the lower one long, the two upper ones short and either straight or hooked, the 3 usually, but not always, equidistant. The writer doubts that the exact position of the middle spiniform or the straight or hooked condition is of any taxonomic value. Process P. is apically dome shaped. Female: The apical outline of the VII sternite is with upper lobe only, the lobe half round to squarish. The spermatheca is barrel-shaped with bent, finger-like appendix. The bursa is very prominent and readily marks these female fleas from others.

The normal hosts for this group of North American fleas are members of the rodent genera Tamias and Eutamias and are commonly known as chipmunks. However, gray and red squirrels are about as frequently infested by these fleas and the predators of the three groups also carry them.

As one views the six subspecies here considered, side by side, it is evident that the face of the modified segment towards the investigator gradually diminishes in surface from one end of the series to the other. This review is arranged according to the amount of surface of the modified segment in the subspecies under consideration. In the series of 6 here represented, the one with the greatest expanse of modified segment is

Monopsyllus eumolpi charlestonensis, a new subspecies.

There are before the writer at this time the holotype male, the allotype female, a paratype female and 4 paratype males, taken off Palmer's Chipmunk (*Eutamias palmeri*) (type host) at the base of Charleston Peak in Kyle Canyon, Spring Mountains (type locality) 25 miles northwest of Las Vegas, Clark County, NEVADA on 25 June 1945. They bear the writer's collection number 2395.

Modified Segments: Male. Finger ham-shaped, slender and longest of the series. Distance from long spiniform to articulation with Process longest in the series, the angle the greatest. Process, high dome-shaped and narrow apically, posterior apical angle rounded. Female. Lobe on VII sternite very large and low down, squarish, with posterior border turned up. Bursa is long, slender and coiled; inconspicuous.

Length: Both male and female measure about 2.25 mm.

Range: Probably throughout Spring Mountains in western Clark County, Nevada.

Deposits: Holotype and allotype on one slide in U. S. National Museum, paratypes in Depositories maintained by writer.

This flea bears the name of the mountain upon which it was collected.

The second of the series shall be called

Monopsyllus eumolpi wallowensis, a new subspecies.

There are before the writer at this time the holotype male, the allotype female and a series of paratypes collected at Wallowa Lake, Wallowa County, OREGON (type locality) off Orange-bellied Chipmunk (*Eutamias a. luteiventris*) (type host) on 13 July 1939. They bear the writer's collection number 1618.

Modified Segments: Male. Finger ham-shaped, broad and slightly shorter than in preceding subspecies. Distance from long spiniform to articulation with Process shorter and the angle less than in preceding. Process dome-shaped but broad and low and with posterior apical angle angulate. Female. Lobe of VII sternite long, narrow and low down on outline. The angles are rounded. Bursa is the most prominent of the series.

Length: Both male and female are just under 3 mm.

Range: This flea is found in the Wallowa Mountains of northeastern Oregon and probably in the Blue Mountains of northeastern Oregon and southeastern Washington.

Deposits: Holotype and allotype on one slide in U. S. National Museum, paratypes in Depositories maintained by the writer.

This flea bears the name of the Oregon county in which it ranges.

Note: During the War years Hubbard was unable to secure type slides from Abroad, therefore he could not compare chipmunk fleas collected in the West with the types. In "Fleas of Western North America," page 237 illustrations under item 122. *M. eumolpi eumolpi* are of this new subspecies as are the "Records" for Oregon on page 238.

The third of the series is

Monopsyllus eumolpi cyrturus (Jordan) 1929.
1929 *Ceratophyllus eumolpi cyrturus* Jordan, Nov. Zool., 35: 34.

Through the kindness of Dr. Karl Jordan of the Tring Branch of the British Museum there are before the writer 2 pairs of paratypes from Paradise, Cochise County, ARIZONA collected 19 October 1913 off skunk by O. C. Duffner. The writer has personally collected materials from the South Gate of Grand Canyon National Park, Arizona taken off Gila Chipmunk on 4 July 1945. While the collection localities are some 200 miles apart the male fleas are similar but the outline of the VII sternite female differ somewhat. The writer doubts the differences enough to create two valid subspecies.

Modified Segments: Male. The finger becomes less ham-shaped to approach the rectangular shape of the following subspecies. Jordan claimed for one of the characteristics the more flattened apical border. The distance between long spiniform and articulation with Process is shorter than in the preceding and the angle is less. The Process is apically high, narrow and dome-shaped. Female: VII sternite of paratype from type locality has small rounded lobe high up on border but specimens taken by the writer at Grand Canyon have a larger upper lobe which is angulate. The bursa is prominent.

Length: Both sexes measure about 2.50 mm. in length.

Range: Known only from Arizona south and east of Grand Canyon.

Deposits: The types are in the Tring Branch of the British Museum.

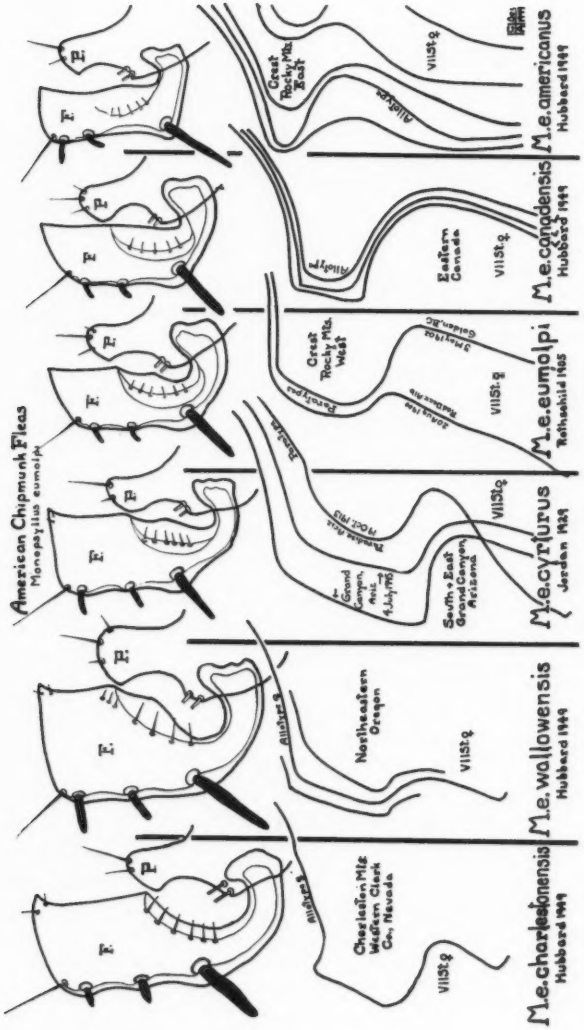

FIG. 1. *Monopsyllus eumolpi* (Rothschild).

Note: Hubbard writing on page 238 in Fleas of Western North America, item 123. *M. e. cyrturus* should have referred all collection records except those under Arizona to *M. e. eumolpi* and the accompanying illustration 123. *M. eumolpi cyrturus* is not an illustration of *cyrturus* but of *M. e. eumolpi*.

The fourth of the series is

Monopsyllus eumolpi eumolpi (Rothschild) 1905.
1905 *Ceratophyllus eumolpi* Rothschild, Nov. Zool., 12: 161.

There are before the writer 2 pairs of paratypes through the courtesy of Dr. Jordan, the large collection of slides of this subspecies in the collection of the Rocky Mountain Laboratory, through the courtesy of Dr. William Jellison, those in the collection of the Plague Suppressive Measures Laboratory, through the courtesy of Frank Prince and Harold Stark, specimens from Wyoming collected by John Wiseman and specimens from Utah collected by Vernon Tipton. The writer's own collection contains hundreds of specimens of these fleas from all over the West.

Modified Segments: Male. The finger is less ham-shaped and approaches the rectangular. The apical border presents quite an angle. The distance from the long spiniform to articulation with the Process is much shortened and the angle less than in the preceding subspecies. Process is apically nicely rounded and dome-shaped with posterior apical angle angulate. Female: VII sternite with lobe variable, high up on outline and either wide or narrow and usually apically rounded. The bursa is prominent.

Length: Males and females around 2.50 mm. in length.

Range: Extensive, north of Grand Canyon, Arizona in Rocky Mountains into Alberta, Canada; west to Crest of Cascade Mountains and in favorable locations as in the Siskiyou Mountains of southern Oregon and northern California on almost to the Pacific Ocean; north from southern Nevada and central Sierra Nevada Mountains of California to and into British Columbia, Canada.

Deposits: Types are in the Rothschild Collection of the British Museum.

Note: All of the records offered by Hubbard in Fleas of Western North America under subspecies of *Monopsyllus eumolpi* are of this subspecies with the exception of specimens from Arizona and Wallowa County, Oregon. These records appear on pages 238 to 241 inclusive.

In the fifth of the series the proportions of the modified segments again become reduced, the finger becoming smaller, the outline VII sternite female with long narrow lobe. It shall be called

Monopsyllus eumolpi canadensis, a new subspecies.

There are before the writer at this time the holotype male, the allotype female mounted on a single slide and 2 pairs of paratypes also mounted a male and female to the slide. The specimens were collected in Ontario, Canada (type locality) off chipmunk (type host) 19 July 1947 by W. Watson.

Modified Segments: Male. Finger is suggestive of preceding but is apically more rectangular. The apical border is still at quite an angle. Distance between long spiniform and articulation with Process shortest of the series so far discussed and the angle is less. The Process is apically high dome-shaped with posterior apical angle well rounded. Female: Lobe of VII sternite high on outline and long and fairly narrow, apically angulate but rounded in the allotype. Bursa weak yet evident.

Length: Both sexes measures a little over 2.00 mm.

Range: Eastern Canada and probably northeastern United States.

Deposits: Holotype and allotype in U. S. National Museum; paratypes in British Museum and Canadian National Museum.

This flea bears the name of the country from which it was described.

The sixth of the series represents *M. eumolpi* with the modified segments in their most diminutive size. It shall be called

Monopsyllus eumolpi americanus, a new subspecies.

There are before the writer at this time the holotype male, the allotype female mounted on one slide personally collected in Painted Desert, Coconino County, ARIZONA (type locality) off Desert Chipmunk (*Eutamias amoenus*) (type host) on 7

July 1945 and the following paratypes: 4 males and 10 females from the collection of the Rocky Mountain Laboratory collected in south central COLORADO and 1 male and 5 females collected by Harold Stark in southeastern UTAH in San Juan County.

Modified Segments: Male. Finger most rectangular of the series. Apical border almost at right angles with anterior and posterior borders. Distance from long spiniform to articulation with Process and its angle shortest of the series, the angle almost a right one. Process while still dome-shaped is very low and flat. Posterior apical angle very noticeable and angulate. Female: Lobe VII sternite most reduced in the series, in the allotype finger-like and high, in paratypes, high, from long finger-shaped to small rounded. Bursa the most reduced in the series, inconspicuous.

Length: In spite of the reduced size of the modified segments this flea is as big as the others in the series and measures about 2.50 mm. in length in both sexes.

Range: East Approaches of the Rocky Mountains north of Little Colorado River. Probably also found in the Great Plains where chipmunks are found.

Deposits: Holotype and allotype are deposited in U. S. National Museum. Paratypes are returned to owners.

Key to Subspecies of *Monopsyllus eumolpi* by Range

1. Northeastern United States and adjacent Canada. *M. e. canadensis*
2. Western Great Plains and east Approaches of Rocky Mountains north of Little Colorado River..... *M. e. americanus*
3. North of Grand Canyon, Arizona from Crest of Rocky Mountains west to Crest of Cascade Mountains. *M. e. eumolpi*
4. South and east of Grand Canyon, Arizona.... *M. e. cyrturus*
5. Isolated in Spring Mountains, western Clark County, Nevada..... *M. e. charlestonensis*
6. Isolated in Wallowa Mountains, Wallowa County, northeastern Oregon..... *M. e. wallowensis*

Conclusions: The writer feels that the degree of difference in the above six warrants subspecific separation. There is

little doubt that as new isolated areas are found and studied new differences will appear and new subspecies. Also there are minor differences within the above six but as the writer views them now he is disinclined to make more separations.

In 1943 Ewing and Fox removed *eumolpi* from the genus *Monopsyllus* and placed it in the genus *Trichopsylla*. Few American flea students have accepted this change and most siphonapterists hold that Ewing and Fox are in error and the change was not warranted.

Enrique Schmidt (1864–1948)

The death of Enrique Schmidt in December 1948 in San José, Costa Rica, marked the passing of one of the outstanding collectors of Tropical American insects.

Enrique, or Henry, as he was better known to his American correspondents, was born January 20, 1864, at Stargard, Pomerania, Germany, the son of Julius and Albertine Schröder Schmidt. In 1891 he came to America, staying first at New York, later going to Galveston, Texas, where he worked for five years for the late Colonel E. M. House, friend and adviser of President Woodrow Wilson. In 1906 he removed to Costa Rica where he was to spend the remainder of his life. Since 1911 he lived and worked as a horticulturist on the largest coffee plantation in Costa Rica, "La Caya," 8 kilos to the west of San José, lying on the Pacific watershed at an altitude of about 1150 meters. La Caya lies between two rivers, the Rio Virilla and the Rio Torres, very broken mountainous country that provided wonderful insect collecting over the many years.

From his earliest days in America, Schmidt was a capable and most energetic collector of insects. Throughout his life he suffered from tuberculosis of the bones which in 1927 necessitated the removal of his right leg. Later he lost the sight of one eye, the hearing of an ear, and suffered the removal of several diseased ribs. Despite all such physical handicaps, he continued his collecting of insects virtually to the end of his life. In 1927, following the loss of his leg, he attempted to earn his

livelihood through the collecting and sale of insect specimens. Schmidt concentrated his attention on certain groups, among them the Thysanura, Collembola, Thysanoptera, Corrodentia, micro-Diptera, micro-Coleoptera, and the Hymenoptera, particularly the ants and bees. About 1913 he became particularly interested in ant guests. A short time before his death Schmidt wrote that "when I began collecting not a single ant guest was known from all Costa Rica while now we know them by the hundreds."

Schmidt himself published little or nothing, but his vast collections have been used in hundreds of publications by others. It is estimated that at least one hundred species of insects that he discovered bear the specific name "schmidti."

C. P. ALEXANDER

Dr. Hermann A. Eidmann

Notice has been received of the death of Dr. Hermann A. Eidmann, Professor of Zoology at the University of Göttingen, on September 4, 1949 at Mittenwald, Oberbayern. Dr. Eidmann's interests among entomological subjects were wide; besides a well-known general textbook, he has published numerous articles on forest entomology and on ecology with special reference to insects. In the last decade of his life, he wrote many fine ecological studies of exotic ant faunas, and it is for this work with the ants that he is perhaps best known in the United States, although his earlier morphological studies are also highly regarded here.

At the time of his death, Dr. Eidmann was at work on a number of projects, including an ecological survey of the ant fauna of Tibet and neighboring areas. He was noted for his ability to cooperate with other specialists throughout the world, and I am sure that others besides the present writer will feel keenly the loss of such an accomplished counselor.

Dr. Eidmann is survived by his wife, Hilde, and two daughters.

W. L. BROWN, JR.

Current Entomological Literature

COMPILED BY RAYMOND Q. BLISS AND R. G. SCHMIEDER.

Under the above head it is intended to note papers received at the Academy of Natural Sciences of Philadelphia and the University of Pennsylvania, pertaining to the Entomology of the Americas (North and South), including Arachnida and Myriopoda. Articles irrelevant to American entomology will not be noted; but contributions to anatomy, physiology and embryology of insects, however, whether relating to American or exotic species will be recorded.

This list gives references of the year 1949 unless otherwise noted. Continued papers, with few exceptions, are recorded only at their first installment.

For other records of general literature and for economic literature, see the Bibliography of Agriculture, Washington, and the Review of Applied Entomology, Series A, London. For records of papers on medical entomology see Review of Applied Entomology, Series B.

NOTE: The figures within brackets [ ] refer to the journal in which the paper appeared, as numbered in the List of periodicals and serials published in our January and June issues. The number of the volume, and in some cases, the part, heft, &c. is followed by a colon (:). References to papers containing new forms or names not so stated in titles are followed by (*); if containing keys are followed by (k); papers pertaining exclusively to Neotropical species, and not so indicated in the title, have the symbol (S).

Papers published in ENTOMOLOGICAL NEWS are not listed.

GENERAL—Abbott, M.—The life of William T. Davis. Cornell University Press, Ithaca, N. Y., $3.50. **An.**—The need for an Annual Review of Entomology (Editorial). [37] 42: 859–60. **Blackwelder, R. E.**—Synonyms and genotypes. [Coleopt. Bull.] 3: 73–75. Studies on the dates of books on Coleoptera. II. **Borgmeier, T.**—Filippo Silvestri 1873–1949. [102] 20: 556. Leica, Contaxe Kine-exacta na entomologia. *Ibid.* 531–34. Genotipo or generotipo? *Ibid.* 630. Sobre a prioridade de página. *Ibid.* 630. Jose Francisco Zikán (1881–1949). (Obit., autobiogr. and bibliography.) *Ibid.* 647–52 (portrait). Que se endende por "publicação? *Ibid.* 653–54. **Boudreaux, H. B.**—A technique for mounting aphids and other soft bodied insects on slides. [37] 42: 846–47. **Bretschneider, L. H.**—A simple technique for the electron-microscopy of cell and tissue sections. [Kon. Nederlandsche Akad. Wetensch.] 52: 654–55, ill. (figs. Odonate muscles). **Casanges, A. H., E. R. McGovran and J. V. Chiles**—Rearing of Anopheles quadrimaculatus and Aedes aegypti in the laboratory. [52] 9: 112–17, ill. **Cole, L. C.**—The measurement of interspecific association. [26] 30: 411–24. **Doutt, R. L.**—The spermatozoon as a diagnostic tool in mealybug taxonomy. [37] 42: 835. **Dove, W. E.**—John B. Hull, 1906–1949. [37] 42: 869. **Grandi, G.**—In memoriam Carlo Menozzi. [Boll. Ist. Ent., Bologna] 14: 193–94, ill., 1942–43. Dedication of Vol. XV to Fillipo Silvestri, with portrait. *Ibid.* 15: v, 1944–46. **Grison, P.**—Alimentation artificielle des insectes phytophages. [Ann. Sci. Nat. Zool.] 10: 59–65, 1948. **Hemming, F.**—El futoro immediato de la nomenclatura en zoologia. [Ann. Soc. Cien. Arg.] 148: 3–8. **Hood, J. D.**—Revista de

Entomologie: An appreciation. (With portrait of Thomaz Borgmeier O. F. M.) [102] 20: 1–2. **Polivka, J. B.**—The use of fluorescent pigments in a study of the flight of the Japanese beetle. [37] 42: 818–21. **Solomon, M. E.**—The natural control of animal populations. [36] 18: 1–35. **Small, J.**—Quantitative evolution. XV. Numerical evolution. [Acta Biotheoretica] 9: 1–37. **Snyder, T. E., and J. M. Miller**—Andrew Delmar Hopkins—1857–1948. [37] 42: 868–69. **Steinhaus, E. A.**—The principles of insect pathology. McGraw-Hill Book Co., New York, Toronto, London, xi, 747 pp., $8.00. **Steyskal, G. C.**—An indexing system for taxonomists. [Coleopt. Bull.] 3: 65–71. **Torres, B. A.**—Notas preliminares sobre insectos coleccionados en goya. [Notas Museo de la Plata] 14 (118): 61–78, ill. **Varley, G. C.**—Population changes in German forest pests. (Review of two articles by F. Schwertfeger.) [36] 18: 117–22.

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